

PEO Ammo



Enterprise Excellence

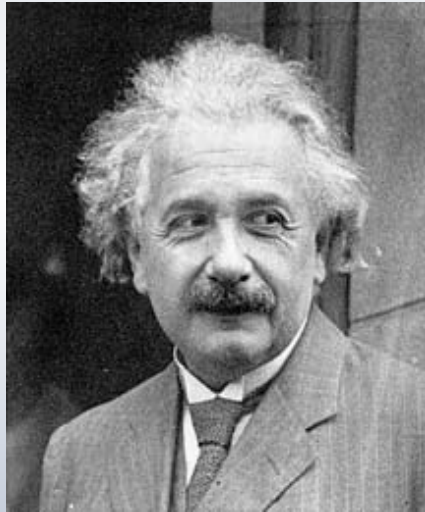
September 16, 2003

Presented By: Mr. Kevin Fahey DPEO



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We cannot solve our problems with the same thinking we used when we created them.



The PEO-Ammunition Transformation and implementation of the FCS is dependent upon new technologies, new management skills and new decision making processes.



PEO Religion

- **Instilling discipline across the board**
- **Permeate six sigma/lean into our business**
 - ✓ **Kicked off a PEO six sigma/lean enterprise executive black belt program**
 - ✓ **Using six sigma principles in the establishment of PEO strategic plans**
 - **Industrial Base**
 - **Demil**
 - **Insensitive Munitions**
 - ✓ **Using six sigma/lean principles in the establishment of PEO wide processes**

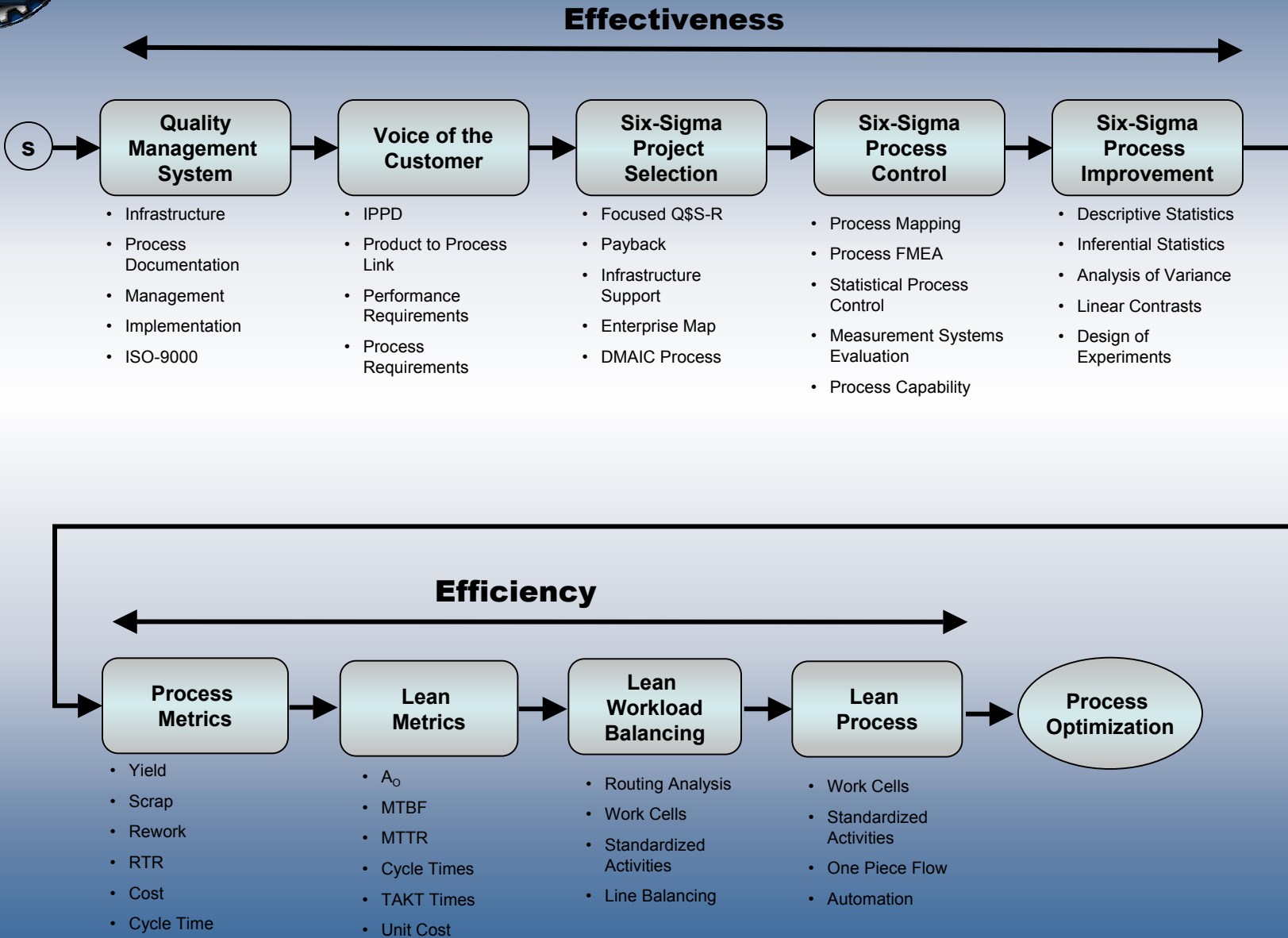


Near-term Focus

- **Continue to integrate ammo management activities within the Army and across other services**
- **Establishing consistent processes across within PEO Ammo**
 - ✓ **Pricing**
 - ✓ **Engineering support**
 - ✓ **Industrial base assessments**
 - ✓ **Program reviews, metrics and reporting**
 - ✓ **Program execution**
 - ✓ **Techbase prioritization and transition**
- **Acquisition manage ammo as a family, by family**
- **Building strong relationships with all major players in the Pentagon (OSD and Army staffs) and other services**
- **Establish more stable funding profiles in POM**
- **FCS ammo and working with PM and LSI**

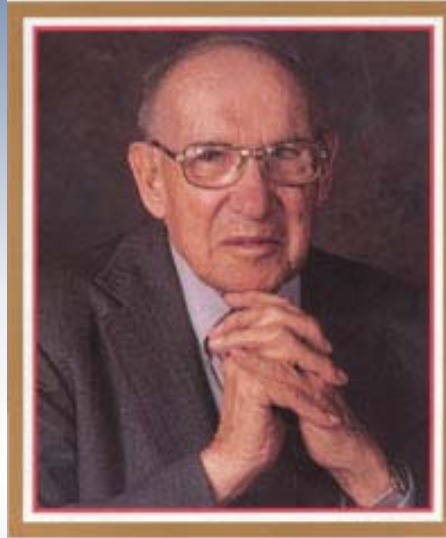


Enterprise Excellence





Enterprise Excellence



“Effectiveness is the foundation of success – efficiency is a minimum condition for survival after effectiveness has been achieved. Effectiveness is doing the right things. Efficiency is doing things right.”

- Peter F. Drucker



Enterprise Excellence

The PEO Ammunition implementation of Enterprise Excellence is a disciplined, structured approach for process and product optimization that is focused on the effectiveness' and efficiency bottom line of the organization.

Effectiveness x Efficiency = Enterprise Excellence



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PEO-Ammunition Implementation of Six Sigma

Six Sigma as implemented by PEO-Ammunition is a disciplined, structured approach for process and product optimization that is focused on the bottom line of the Army:

- ✓ Product and Process Improvement
- ✓ Reduce Rework and Scrap
- ✓ Reduce Production Costs
- ✓ Improves Production Reliability
- ✓ Reduce Field Failures



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PEO-Ammunition Implementation of Lean Enterprise

Lean Enterprise is a set of principles and tools in a structured process that enable organizations to:

- ✓ **Identify the value stream**
- ✓ **Identify value added and non-value added process elements**
- ✓ **Reduce cycle time**
- ✓ **Reduce cost**
- ✓ **Reduce waste**



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PEO-Ammunition Implementation of Design for Six Sigma

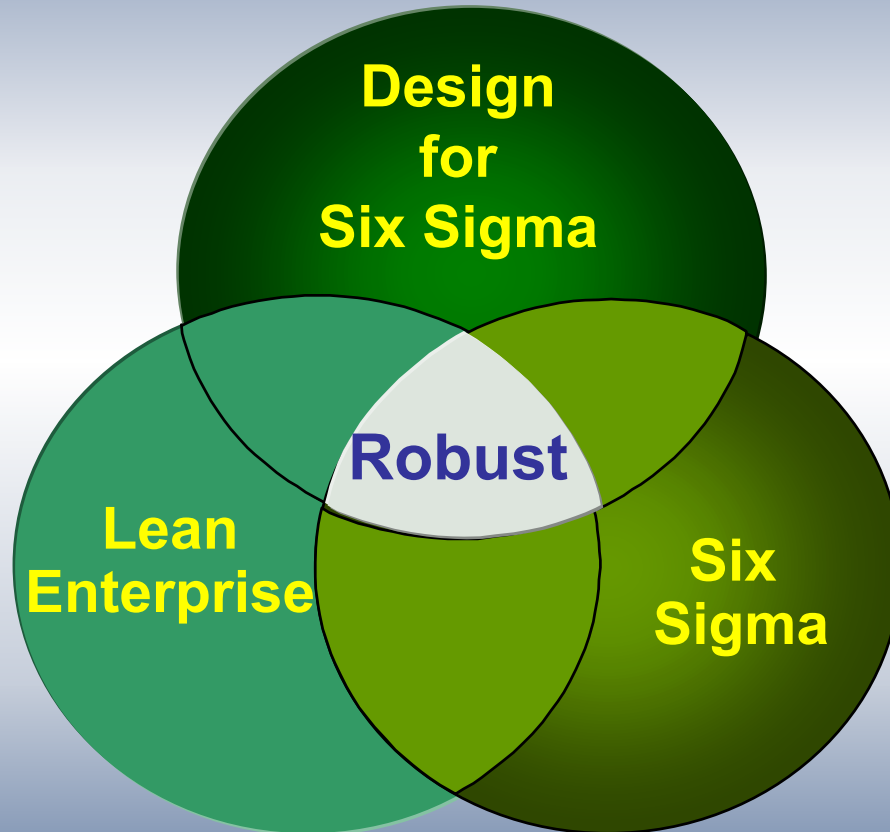
The DFSS methodology is a structured design & development process made up of the elements of Concept Development, Design Development, Optimization of Design, and Verification of Capability (CDOV)

- ✓ **Integrated Product and Process Design and Development**
- ✓ **Reduces Research and Development Cycle Time**
- ✓ **Reduces Cost by Shortening Concept to Soldier Time**
- ✓ **Improved design reliability**
- ✓ **Insures that all environments are considered during R&D**



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PEO-Ammunition Holistic Implementation



Robust Products and Services



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PEO-Ammunition Commitment

The PEO Ammunition in partnership with VSE Corporation's Management Sciences Division has lead the way in implementing Enterprise Excellence in the Ammunition Enterprise:

- ✓ Executive Champions 147
- ✓ Green Belt Six Sigma Lean 638
- ✓ Black Belts Six Sigma Lean 189
- ✓ Total Productivity Maintenance 41
- ✓ Current Process Improvement Projects Approximately 200 within the Ammunition Enterprise

PM-GCS

American
Ordnance

ATK

ARDEC

GD

PM-MAS

PM-CAS

JMC



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PEO-Ammunition Commitment

Executive Black Belt Workshop

- **Special Black Belt Workshop**
 - **PEO**
 - **PEO Executives**
 - **JMC Executives**
- **Black Belt Workshop**
- **Black Belt Improvement Projects**



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PEO-Ammunition Applications

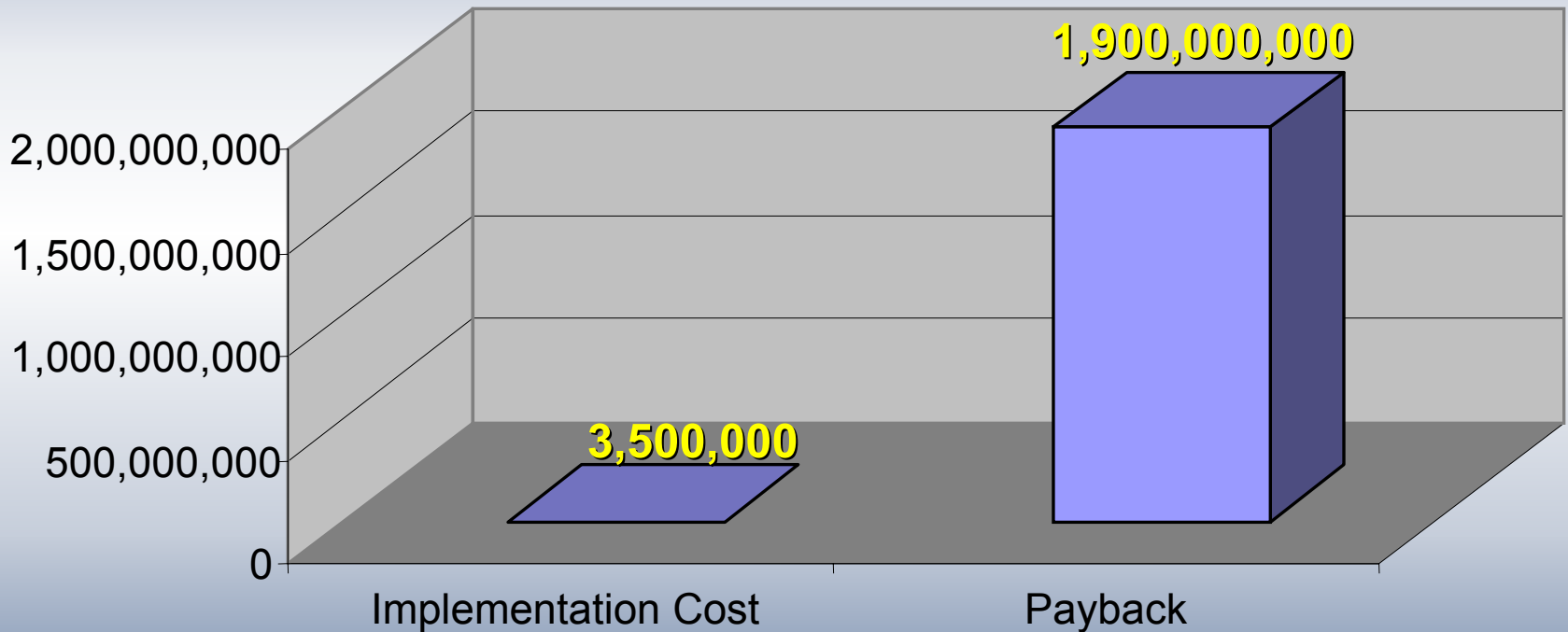
Organization	Problem	Solution	Result
PEO-Ammunition PM-CAS	<ul style="list-style-type: none"> Procurement Administrative Lead Time (PALT) Exceeded Congressionally Mandated Milestone Requirements 	Procurement Process Optimization <ul style="list-style-type: none"> Process Map (VSM) Cycle Time Analysis VA, NVA, ENVA Analysis 	<ul style="list-style-type: none"> Reduced Cycle Time from 24 months to 11 Reduced Cost by \$12,000,000
TACOM-ARDEC TACOM-WECAC TACOM-FSAC	<ul style="list-style-type: none"> Cycle Time and Cost of production for PAX-2A insensitive Munitions exceeded available budget. 	R&D Process Optimization <ul style="list-style-type: none"> Process Map (VSM) Cycle Time Analysis Process Metrics Process Control Designed Experiment 	<ul style="list-style-type: none"> Reduction in cost from \$65 per pound to \$30 per pound for potentially 18,000,000 pounds Process yield increased from 30% to 90%+ Significantly Reduced Program Cost and Schedule Risk
PEO-GCSS PM-CAS TACOM-ARDEC	<ul style="list-style-type: none"> 120MM Ammunition Production Process Poor Quality and Rejected Material. Lost Training Time and Opportunity for Soldiers due to unavailable material. Significant cost to perform rework and scrap material. 	Production Process Optimization <ul style="list-style-type: none"> Process Map (VSM) Parameter Studies Process Metrics Process Control Designed Experiment Improved Procedures 	<ul style="list-style-type: none"> Cost Avoidance <ul style="list-style-type: none"> Rework Per Lot 7.5 Million Lost Training Time and Opportunity \$244,000 Reduces Risk of Missed Training Opportunities Increased Confidence in Munitions by Soldiers.
TACOM-ARDEC	<ul style="list-style-type: none"> Excalibur XM982 Planning and Scheduling Process Delivering material late to production. 	Planning Process Optimization <ul style="list-style-type: none"> Process Maps Affinity Diagram Interrelationship Digraph Cause and Effect OFD FMEA 	<ul style="list-style-type: none"> New Scheduling Process Eliminating waste and reducing cycle time Scheduling Process Controls Reduced Risk of missing schedules Deliveries are now on Schedule.
PEO-Ammunition PM-CASS TACOM-ARDEC	Development process for smart/precision munitions is too costly and too long.	Engineering Process Optimization <ul style="list-style-type: none"> Process Maps VA/NVA/EVA Analysis Test requirements Analysis using DOE, Reliability Engineering and QFD 	<ul style="list-style-type: none"> Cost avoidance of \$35,000,000 Eliminated waste and reduced test cycles Reduced risk of low reliability yielding additional schedule and cost benefits



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Ammunition Enterprise “Payback”

PEO-Ammunition Return on Investment



Return on Investment (ROI) = 542/1



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PEO-Ammunition Implementation Philosophy



**Change is Not a Requirement
Because
Survival is Not Mandatory**



Q&A



Supplementary Information

- **Examples of Enterprise Excellence Projects**
- **Improve Procurement Administrative Lead Time (PALT)**
- **PAX-2A Process Optimization**

Examples of Enterprise Excellence Projects

Project Description	Organization
Optimize the wax application process using new ARDEC facilities.	WECAC
Develop a simulation of the PAX-2A production process to better predict the operation's behavior and results/yields.	WECAC
Develop a "heating system" to allow the telemetry battery supply power at -45 degrees Fahrenheit.	PM-CAS & FSAC
Optimize the slurry analyzer measurement system installed at Iowa Army Ammunition Plant.	PM-CAS
Optimize the manufacture and testing processes of pyrotechnic delays and reduce destructive test sample size.	JMC
Evaluate a go-forward path for the improvement of Insensitive Munitions performance of M795 and M107 Projectiles.	PM-CAS & JMC
Optimize the tempering process to control the mechanical properties differential of the breech/muzzle ends of 120mm Tank guns (M256).	Watervliet Arsenal
Improve the yield of PAX-2A Manufacture at Lab-Scale by developing an alternate mix process that meets high-speed LAP requirements.	WECAC
"Resurrect" the production of M54 Burster components.	PM-CAS
Transform the former OPM ARMS into a Most Effective Organization (MEO) that integrates lean into the best business practices of OPM Mortars and the former OPM ARMS.	PM-CAS
Resolve gun wear on the XM777 Howitzer when using MACS charges.	PM-CAS/PM-JLW
Insure the production know-how for this material is not lost, thus preventing over 40 end-item re-qualifications.	WECAC
Erie Press. Goal: Improve Quality of run out to .090.	GDOTS Red Lion

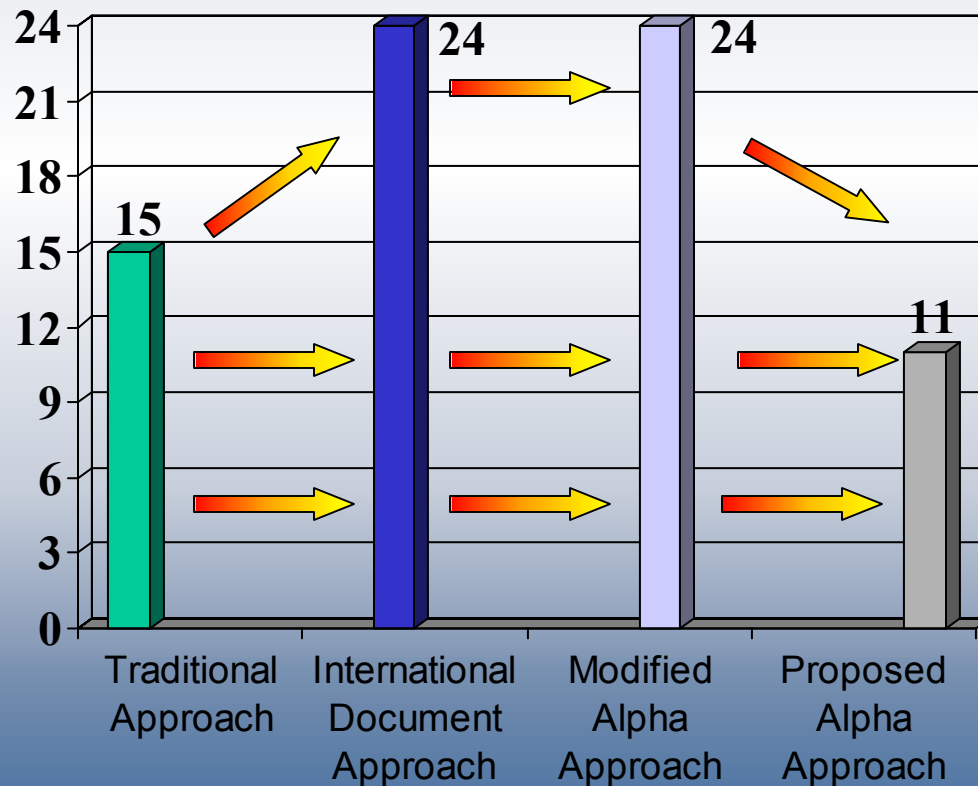
Improve Procurement Administrative Lead Time (PALT) Green-Belt Project



Presented By:
The Six Sigma Alpha Team
Faith M. Harder
Scott Cawood
Cynthia Schoner

Statement of Problem

Need to reduce Procurement Administrative Lead Time (PALT). Funding decrements will occur due to late/delayed award



**Need to Combine
Two 24 Month
Processes into
One Process
That is < 1 Year.**

Six Sigma Project Tools

- Cause & Effect Analysis
- Failure Mode & Effects Analysis
- House of Quality

Identified & Prioritized the Issues at Hand. Helped to Define Process for Improvement. (Action Items)

- **Level I Process Map**
 - Improved PALT Process Map

- **Level II Process Maps**
 - Int'l Documentation Approved
 - Traditional Contracting Process
 - Improved Alpha Contracting Process

This Provided us a Picture of What Needed to be Accomplished to Effect an Accelerated Process

- **Gantt Chart**
 - Improved PALT Process
 - Int'l Document Approval Process
 - Traditional Contracting Process
 - Alpha Contracting Process

This Provided the Baseline and Tracked Progress Against the Baseline

Six Sigma Project Tools

➤ Resources

- Brainstorming
- Weekly Scheduled 6 Sigma Meetings
- Consultation:
 - ✓ Legal (Int'l Process)
 - ✓ Black Belt
 - ✓ Sponsor
- Cross Functional Team
 - ✓ Contracting Officer
 - ✓ Procurement Analyst
 - ✓ Project Engineer

Basic Requirements needed to Accomplish a Six Sigma Project:

- Who?
- What?
- Where?
- When?
- How?
- Why?

Pay Back

- **A Bi-Lateral Modification Incorporating U.S. and Foreign Technologies Signed by 31 Oct 02**
- **Successfully Accomplished Milestone 1 (of 19) Under DA Review**
- **Reduce Risk of Program Funding Decrements and Possible Cancellations**
- **Reduced Cost of Procurement by \$12,000,000**



Six Sigma & Value Engineering (VE) Status Update

Presented to:

The TACOM-ARDEC Six Sigma Board

Presented by:

Donald A. Geiss Jr.

*Explosives Research & Technology Team
Energetics & Warheads Division, WECAC
dgeiss@pica.army.mil, (973) 724-3261*

October 3, 2002

Value Engineering Proposals (VEPs)

- 1. Improve Thiokol Manufacture Process**
- 2. Maximize High-Speed Loading Capability**
- 3. Scale-up Holston Slurry Mix Process**
- 4. DPICM Fuze Removal Process**

Six Sigma Project Tools

- **Process Mapping**
- **Cause & Effect Analysis**
- **Failure Mode & Effects Analysis**
- **House of Quality**
- **Analysis of Variance**
- **Design of Experiments**
- **Process Modeling**
- **Process Optimization**
- **Confirmation Runs**

VEP #1 - Improve Thiokol Manufacture Process

Objective:

- ✓ **Increase Yield & Lower Cost of Thiokol Manufactured PAX-2A**
- ✓ **Satisfy High-Speed Loading (less spillage/smearing)**

Baseline (before Six-Sigma): April 2001

- ✓ **13% yield**
- ✓ **\$131.70/lb**
- ✓ **Safety Issues with High-Speed Loading**

Improvement (after Six-Sigma): September 2002

- ✓ **50% yield**
- ✓ **\$67.67/lb**
- ✓ **Fully Compatible with High-Speed Loading**

VEP #2 - Maximize High-Speed Loading Capability

Objective:

- ✓ **Develop Robust Process for Loading Grenade Submunitions with IM Explosives**
- ✓ **Eliminate Spillage and Tooling Smearing**
- ✓ **Maintain or Improve Grenade Performance**

Baseline (before Six-Sigma): April 2001

- ✓ **2,000 grenades/10 hr shift**
- ✓ **Safety Issues with High-Speed Loading**
- ✓ **Inconsistent performance**

Improvement (after Six-Sigma): September 2002

- ✓ **28,000 grenades/10 hr shift**
- ✓ **Fully Compatible with High-Speed Loading**
- ✓ **Improved consistent performance**

VEP #2 – Cost Avoidance

- DZI-Lonestar Load Line Efficiency Improved from 2000 grenades/10 hr shift to 28,000 grenades/10 hr shift:
- Reduced Time from 140 hrs to 10 hrs per 28,000 grenades
- Load Line Cost \$11,658 per 10 hr shift to operate
- Cost Avoidance = \$151,554/28,000 grenades = \$5.41/grenade
- Total Cost Avoidance for M915 program = 11,900 units x 42 grenades/unit x \$5.41/grenade = \$2,703,918

		Procurement Objective			Army Acquisition Objective		
		# Rounds (x1000)	PAX-2A (x1000 lbs)	FY	# Rounds (x1000)	PAX-2A (x1000 lbs)	FY
M915 105mm	XM80	11.2	18.8	03	157	260	04-12
GMLRS	XM85	83.9	1,052	07-21	140	3,862	21+
XM984	XM80				40 (notional)	85.6	05-08
M864 RECAP	M42/M46	71	375	03-07	440	2,324	
Total Pounds PAX-2A (x1000)			1,445.8			6,531.6	

Potential Cost Avoidance to Army for load line cost reduction of \$5.41/grenade:
\$213.7 M (PO) + \$524.5 M (AAO) = \$738.2 M

VEP #3 - Scale-up Holston Slurry Mix Process

Objective:

- ✓ **To develop an alternate process to increase yield and reduce cost of PAX-2A**

Baseline (before Six-Sigma): April 2001

- ✓ **\$65/lb at 30% yield**
- ✓ **Current Actual \$67.67/lb at 50% yield**
- ✓ **Could not achieve 0.85 g/cc bulk density required for high speed loading with Slurry Mix Process**

Improvement (after Six-Sigma): December 2003

- ✓ **Projected \$30/lb at 100% yield**
- ✓ **Achieved High-Speed Loading bulk density requirements with the Slurry Process**

VEP #3 – Cost Savings

- PAX-2A Manufacture Yield Increased from 50% to 100%:
- Original proposed cost of PAX-2A before six-sigma = \$65/lb.
- Projected PAX-2A cost after six-sigma = \$30/lb
- Cost Savings = \$65/lb – \$30/lb = \$35/lb
- Potential Cost Savings for M915 program = 11,600 lbs x \$35/lb = \$406,000

		Procurement Objective			Army Acquisition Objective		
		# Rounds (x1000)	PAX-2A (x1000 lbs)	FY	# Rounds (x1000)	PAX-2A (x1000 lbs)	FY
M915 105mm	XM80	11.2	18.8	03	157	260	04-12
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XM984	XM80				40 (notional)	85.6	05-08
M864 RECAP	M42/M46	71	375	03-07	440	2,324	
Total Pounds PAX-2A (x1000)			1,445.8			6,531.6	

Potential Cost Savings to Army for cost reduction PAX-2A from \$65/lb to \$30/lb:
\$50.6 M (PO) + \$228.6 M (AAO) = \$279.2 M

VEP #4 - DPICM Fuze Removal Process

Objective:

- ✓ **Develop a practical and cost effective process for reuse of existing Dual Purpose Improved Conventional Munition (DPICM) grenades for future Insensitive Munition (IM) compliant weapon systems**
- ✓ **Specifically address the fuze removal process**

Baseline (before Six-Sigma): April 2002

- ✓ **Must use new bodies at \$4.50 each**
- ✓ **No effective process available for RECAP DPICM with SD Fuze**

Improvement (after Six-Sigma): December 2002

- ✓ **Potential to Reuse bodies at \$1.24 each processing cost**
- ✓ **Potential to reattach several candidate Self Destruct Fuzes (SDFs) during RECAP**
- ✓ **Additional cost avoidance for DEMIL of existing stockpile**

VEP #4 – Cost Avoidance

➤ Reuse Projections

- ✓ 18,528 MLRS Rockets = 7,744,704 grenades
- ✓ 54,000 M864 Projectiles = 3,888,000 grenades
- ✓ Total = 11,632,704 grenades

➤ Cost Avoidance gained from Body Reuse

- ✓ New body = \$4.50/grenade
- ✓ Reuse Cost: Fuze Removal = \$0.52/grenade;
Liner & Comp A5 removal = \$ 0.72/grenade;
 $\$0.52 + \$0.72 = \$1.24/\text{grenade}$
- ✓ Cost Delta = \$3.26/grenade

➤ Total Cost Avoidance

- ✓ $\$3.26/\text{grenade} \times 11.6\text{M grenades} = \mathbf{\$37.9M}$

➤ Additional Cost Avoidance

- ✓ \$3.5 (OBOD) to \$17.5M (KAAP Recycling method) for demil of over 11.6M existing grenades